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Department of Interior
Bureau of Land Management

FINAL REPORT

For the

ANALYSIS of INVENTORY AND MONITORING ACTIVITIES in BLM

October 2008

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Appendix A BLM Survey (separate file)
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1 Executive Summary

This inventory and monitoring (I&M) analysis is being conducted to assist the BLM in overcoming the steadily increasing challenges in meeting the growing requirements for I&M activities. The findings of this study indicate the level of effort required to conduct past commitment monitoring (i.e., monitoring that field offices (FO) are committed to by regulation, permit, court order, biological decision, or associated RMP) will not decrease in the foreseeable future, and new demands for compliance monitoring to meet the needs of wind farms, solar farms, and oil and gas pads are rapidly increasing to the point that FO's are struggling or unable to keep up. Additional challenges are found in hiring and retaining qualified personnel, the fundamental resource for any monitoring program, without whom I&M requirements will never be met. Many field offices report an inability to hire qualified personnel to fill specialist positions or geographic information systems (GIS) administrator positions due to funding constraints, general lack of qualified personnel in the workforce as potential new hires, or challenges stemming from remote locations where some field offices are located. A dramatic increase in funding to meet the increase in I&M requirements in not likely. Accordingly, the BLM will have to find smarter, more efficient ways to conduct I&M to successfully complete the I&M mission.

This analysis was conducted using techniques designed to generate recommendations to assist in creating more efficient I&M operations throughout the Bureau. A workload survey was completed by a random sample of personnel who conduct I&M activities. The workload survey was followed by telephone interviews with selected I&M specialists to verify and expand on information gathered via the workload surveys. On-site visits were conducted to field and district offices throughout the BLM states to meet face-to-face with both management and I&M specialists to gather input on initial findings and hear directly from those who conduct I&M daily. The overall analysis was guided by an Oversight Team representing BLM states, the National Operations Center (NOC), and the Washington Office (WO). Senior management was informed on progress at each step of the analysis process.

The following recommendations were developed based on the results of the analysis process. They are designed to enhance both the productivity and quality of I&M activities as conducted by BLM. Recommendations and discussion are provided in more depth in section 10 of this report.

Recommendation 1: Consider adopting over the longer term a full cost recovery system for permits and monitoring of permitted activity. Landscape monitoring is what is needed but very often field offices and/or states cannot afford to go to a landscape-based monitoring program. Part of the overall cost recovery scheme could very well have an option to have other parties do the monitoring required during the permitting process.

Recommendation 2: Update existing guidance for I&M activities to ensure the guidance is grounded in a cross-program understanding of the basic components for a successful I&M program. Use existing capabilities found on the BLM intranet as a central, web-

based repository for storing this information such that is easily available to all who require access.

Recommendation 3: BLM adopt USDA Forest Service I&M guidance for forestry inventory & monitoring work, with modifications as needed to meet BLM requirements.

Recommendation 4: Develop a standardized training program to provide currency training to specialists in all disciplines. Additionally, stress mentorship of specialists to enhance their career development.

Recommendation 5: Standardize I&M data collection and storage across the BLM. Aggressively pursue the ongoing efforts of the National AIM Strategy and the MEDS subcommittee to achieve improved data management capabilities. Establish a policy and guidelines for dealing with legacy data.

Recommendation 6:

- Employ digital imagery and 'SamplePoint' software (developed and owned by the federal government) as tools to increase the quantity, reliability, and usability of rangeland and reclamation monitoring data, while dramatically reducing costs.
- Develop a system for the storage and management of the large volume of data generated by aerial and land-based digital imagery monitoring methods.

Recommendation 7: Place a high priority on remedying the shortage of soils expertise at field locations by:

- Providing formal training in soils to at least one scientist in each district or field office.
- Highlighting and targeting the shortage of soils scientists in the BLM recruitment strategy.

Recommendation 8: Develop a planning process that facilitates the ability of field offices to manage resources on a landscape/watershed basis and that leads to an informed decision on what I&M work needs to be accomplished and how it can be integrated with other activities required within the landscape/watershed. In concert with this, increase the effectiveness of interdisciplinary (ID) teams consistent with current guidance and regulations.

Recommendation 9: Pursue all means to increase efficiency when conducting I&M activities to include increased use of partnerships, cooperative and interagency agreements, and memoranda of understanding (MOU) and focusing on development of more efficient contracting procedures to enhance the use of contracting opportunities. Have contracting vehicles, such as indefinite delivery indefinite quantity (IDIQ) and basic ordering agreements (BOA), in place for field offices to access immediately.

Recommendation 10: Develop a dedicated and institutionalized "SWAT" Team that focuses on promotion of best ideas and rapid removal of barriers that prevent efficient I&M efforts.

Recommendation 11: Explore the concept of creating monitoring centers for multiple program areas, e.g. Rangeland management, Forests/Woodlands, Air/Climatic conditions, and Invasive Species. Institutionalize the existing National Aquatic Monitoring Center.

2 Purpose of the Study

This Inventory and Monitoring (I&M) analysis was conducted to develop efficiencies in the I&M practices as conducted by the BLM. Conducting I&M more efficiently will lead to more effective use of BLM funding to accomplish all I&M objectives and enable better stewardship of the public lands and resources for which BLM is responsible. With no projected increase in real funding levels, it is essential that BLM develop the capability to conduct new effectiveness monitoring in coming years within existing resources. Additionally, conducting I&M more effectively and efficiently will enhance the ability of BLM to address recent Office of Management and Budget (OMB) findings that BLM collects insufficient data to determine effectiveness of actions.

The analysis complements and enhances previous related studies and initiatives that have been undertaken by the BLM in the recent past. Desired outcomes of the study were specifically crafted to shape the future of Inventory and Monitoring activities within the BLM and its partners across the governmental and non-governmental spectrum. A more coordinated Assessment, Inventory, and Monitoring (AIM) process will enhance BLM's ability to gather data related to resource conditions across the millions of acres for which the Bureau is responsible, allow a better understanding of the needs of BLM's customers, and promote better decision making on land use planning and use authorization issues.

3 Overview of BLM I&M Activities

3.1 General

The BLM is responsible for a variety of programs involving the management and conservation of resources on 258 million surface acres, as well as 700 million acres of subsurface mineral estate. These public lands make up about 13 percent of the total land surface of the United States and more than 40 percent of all land managed by the Federal government.

Most of the public lands are located in the Western United States, including Alaska. These lands are characterized by extensive grassland, forest, high mountain, arctic tundra, and desert landscapes. The BLM manages multiple resources and uses, including energy and minerals; timber; forage; recreation; wild horse and burro herds; fish and wildlife habitat; wilderness areas; and archaeological, paleontological, and historical sites.

In addition to its minerals management responsibilities, the BLM administers mineral leasing and oversees mineral operations on Federal mineral estate underlying other state, private, or Federally-administered land, and manages most mineral operations on Indian lands. The BLM also administers about 57 million acres of commercial forests and woodlands through the Management of Lands and Resources and the Oregon and California Grant Lands appropriations.

Under its multiple-use management mandate, the Bureau manages public lands under a multiple use mandate, administering grazing permits and leases on 160 million acres of public rangeland. BLM manages rangelands and facilities for 57,000 wild horses and burros. The 258 million acres of public land administered by the BLM includes over 117,000 miles of fisheries habitat.

The Bureau has an active program of soil and watershed management on 175 million acres in the lower 48 states and 86 million acres in Alaska. Practices such as revegetation, protective fencing, and water development are designed to conserve and enhance public land, including soil and watershed resources. BLM is also responsible for fire protection on public lands and on all Interior Department land in Alaska, as well as for wildfire management on the public lands in Alaska and the Western States.

The responsibilities inherent in balancing this mix of resources and uses continues to grow in complexity as the West's population growth creates new pressures and heightens existing management challenges. This population growth in the west and the urbanization that accompanies it coupled with a new emphasis on finding renewable sources of energy place new and increasing demands on the land BLM manages. These factors combine to highlight the need to accelerate improvements needed to create more efficient BLM business practices not only in I&M, but across the spectrum of BLM operations to address these expanding organizational challenges[1].

[1] BLM National Webpage, About the BLM

3.2 Inventory and Monitoring Defined

Inventory is the gathering of baseline information (including quantitative data, cultural knowledge, and qualitative observations) about condition of resources. Examples of inventory are Ecological Site Inventory, and Population Counts of Threatened or Endangered Species.

Monitoring is the regular collection of data to evaluate whether objectives or land health standards are being achieved; and the effectiveness of management actions. [2]

3.3 Why I&M is Conducted

Congress mandates that BLM work to sustain the health of public lands for the use and enjoyment by present and future generations. To do this, the BLM must conduct inventory and monitoring activities of the land and resources to determine condition and trend and to be able to make appropriate management decisions to ensure they remain in a healthy state. Results of I&M activities:

- Establish the land condition on both a short and long term basis.
- Allow the BLM to support specific programs and projects (e.g., habitats for special status species, fuels, restoration & rehabilitation, wildlife studies, etc.)
- Establish land health trends
- Support land use decisions

3.4 Ongoing BLM Efforts to Improve Inventory & Monitoring

This analysis supports other efforts previously undertaken and currently ongoing by the BLM. Each of these efforts are intended to improve the overall coordination, integration, and conduct of the BLM's Assessment Inventory and Monitoring activities, although each applies different approaches. Although not part of these other planning efforts, this analysis has been conducted to coordinate with, complement, and enhance the findings and recommendations as previously documented. A brief summary of a select few of these other efforts is provided to offer context regarding how this analysis integrates into the overall I&M improvement initiatives.

The Healthy Lands Initiative (HLI) is a central feature of the BLM's plan to improve the health and productivity of the nation's public lands it is responsible for managing. It orients the efforts of BLM personnel to restore and conserve across a broad scale of acreage at an accelerated pace of expected results. HLI promotes a landscape-level approach that will enable and encourage local managers to set priorities and manage across landscapes and mitigate impacts to an array of resources in ways not previously available to them. "*Meeting both our energy and land health goals requires integrated, landscape-scale habitat protections and resource management. Our initiative combines investments in habitat protection with policy improvements that will protect 800 species, including the sage-grouse.*"[3] I&M efforts across the BLM are integral to meeting HLI landscape-level goals.

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[2] BLM Handbook 4180 Release 4-107 (1/19/2001) I-5.

[3] Secretary of the Interior Dirk Kempthorne, 2009 Budget Update for the Healthy Lands Initiative (National).

The BLM commissioned the National Assessment Inventory and Monitoring (AIM) Strategy in 2005 to integrate assessment, inventory and monitoring processes and standards across programs and field operations. The National AIM Strategy established Work Groups from members of the BLM workforce at the local, regional and national levels to conduct the requirements of the Work Group efforts. The Local Work Group conducted a survey with a random sample of field offices, results of which were combined with other contextual information to form the basis for conclusions about the National AIM Strategy for the future. Among the initial findings of this effort is that at this time the Bureau has a wide variety of data collection methods and databases, often covering related areas, but not able to address organizational questions related to land condition and health. The AIM Strategy will address how best to collect and roll up data and ensure that the data collected addresses critical questions for decision makers at every level within the BLM.

The Managing for Excellence Data Strategy (MEDS) is a component of the overall Managing for Excellence initiative. Designed to streamline the Bureau's administrative processes, MEDS is specifically addressing Bureau data requirements. Addressing data needs at every level in the organization will lead to improvements in data standardization and to increased efficiency in the use of data collected during I&M activities.

The BLM created the Geospatial Services Strategic Plan (GSSP) to improve geospatial activities across the BLM. Local, regional, and national action items were developed in the areas of governance, business processes, education and outreach, and data, application, and technology architectures. Each of these areas directly supports I&M requirements and improvements in any or all of these areas and will indirectly improve the efficiency and effectiveness of AIM activities throughout BLM.

4 Analysis Methodology

The analysis team conducted this study using a multi-faceted approach that included coordination across all organizational levels of the BLM. The overarching methodology was designed to meet analysis objectives by gathering information from BLM management, employees, and experts who participate in I&M activities. To accomplish this, the analysis team devised a three step approach. The steps of the approach were: (1) conduct a nationwide workload survey of BLM employees participating in I&M; (2) interview selected survey respondents in depth by telephone; and (3) make field visits to selected BLM field offices, district offices, national monuments, and state offices to refine data collected and meet face-to-face with BLM employees engaged in I&M work. A newly formed Oversight Team (OT) and the standing BLM Field Committee were used to guide the analysis and validate the findings and recommendations. Deputy Assistant Directors were kept informed of progress and initial findings. State Directors were also engaged and provided much needed coordination during several significant steps of the analysis to ensure their state organizations were informed and could provide the required support at the district and field office levels to assist in the completion of the analysis.

4.1 Field Committee and Oversight Team

Oversight Team membership was chosen from employees and managers from six states, the National Operations Center (NOC), and the Washington Office (WO). It was designed to manage the operational details of the analysis, undertake coordination, and seek guidance up the chain with senior BLM leadership and make contact with field level personnel when required. The OT provided hands-on management and guidance and also served as an avenue for corporate level feedback within the organizational structure of the BLM. The OT met regularly to provide the initial guidance for conducting the analysis and to define the objectives and scope the analysis across the BLM's I&M activities. The standing BLM Field Committee validated the process, methodology, and the scope of the analysis and provided senior management oversight. The Field Committee received updates on the broader details of the analysis and provided direction and guidance to shape the goals, expectations, and desired outcomes of the study. Membership of the Oversight Team is shown in Table 4.1 below.

Table 4.1

Name	Specialty	BLM Directorate
Barbara Hill	Special Status Species Biologist	OR
Barron Bail	Lead on M4E Data Subcommittee	ES
Ed Horn	Soil Scientist, ESI	OR
Bill Stringer	Field Manager, Vernal Field Office	UT
Gina Ramos	Senior Weed Specialist	WO
Gordon Toevs	Program Analyst, Rangeland Resources	WO
Jack Hamby	Deputy Chief, Rangeland Resources	WO
Jamie Connell	Field Manager, Glenwood Springs	CO
Jim Cagney	Range Management Lead	WY

Kelli VanNorman	Biologist	OR
Peter Ditton	Associate State Director	ID
Sherm Karl	Inventory and Monitoring Specialist	NOC
Steven Smith	Range and Riparian Specialist	ID
Tim Bottomley	FORVIS Data Steward	NOC
Tom Mendenhall	Senior National Fisheries Program Manager	WO
Craig MacKinnon	AIM Project Manager	WO

4.2 Support Contractor

CACI, Inc was designated as the support contractor to assist with the I&M analysis. Members of the team had extensive backgrounds in management consulting, business process reengineering, and in developing more efficient and cost effective means of conducting business operations. Team members included:

- George Alexander, Project Manager
- Pete Broh, Senior Consultant
- Ed Wolfe, Senior Consultant
- Chad Kuhn, Senior Consultant and Geospatial Information Specialist

4.3 Reduced Scope

The Oversight Team worked with the Field Committee to recommend a reduction of the scope of the analysis to include 18 of the total Program Element (PE) codes that track I&M activities. This recommendation was approved by the Assistant Director for Renewable Resources and Planning. Narrowing the focus of the analysis allowed for a more in depth look at these select I&M activities in order to maximize the resources made available to conduct the analysis. Findings and recommendations were then applied to the broader scale of all I&M activities conducted by the BLM to reach conclusions and recommendations applicable BLM-wide. The 18 PE codes selected are in Table 4.2 below.

Table 4.2

PE Code	PE Code Description
BN	Water Resources
BP	Watersheds
BR	Shrub/Grass/P J Vegetation
BS	Invasive and/or Noxious Weeds
BT	Forest/Woodland Vegetation
CB	Wildlife/Plant Habitat
MB	Forest/Woodland Treatments
MI	Air Resources/Climatic Conditions
MJ	Rangeland Health
MK	Weed Treatments
MN	Lake/Wetland Habitat
MO	Stream/Riparian Habitat
MQ	Terrestrial Habitat
MR	Species Populations

MT	Fuels Treatment
MU	Water Resources
MX	Shrub/Grass/Vegetation Treatments
MZ	Fire Rehab Treatments

4.4 Review of Existing Information

BLM collects information in different ways from a multitude of sources to document annual I&M activities. This information is in the form of budget and cost accounting data, production goal accomplishment reporting, summary reporting, and other specialized data calls and reporting to answer management questions at all levels of the chain of command. The analysis team collected and analyzed data from these established information sources, and combined with information collected during the analysis project enabled an understanding of annual baseline costs and annualized production of the BLM's I&M activities. Recent studies and presentations of BLM I&M activities were also reviewed to gain a better understanding of how I&M is conducted within the Bureau.

4.5 Workload Survey

The analysis team developed a Microsoft Excel-based workload survey designed to augment existing data on I&M costs by identifying how much time employees spend on various aspects of the work and to gather information on current I&M practices among BLM personnel. The survey contained a cover page linked to a separate data collection page for each of the 18 PE codes in the analysis. Several general identification and demographic questions were included on the cover page. The workload survey asked nine standard questions for each PE code, each designed to gather information in the separate areas of planning, data gathering, and data storage and analysis activities. Each page had additional questions for employees to provide information about shared databases being used by data collection personnel and about anticipated changes in annual I&M production. Survey respondents were also provided space for additional comments. A detailed set of instructions guiding completion of the survey was included. The survey and completion instructions are attached as Appendix A and B to this report. Workload survey results and analysis are presented in more depth in section 7, para 7.2.

4.6 Telephone Interviews

The workload survey produced a large quantity of relevant statistical information detailing work practices from among those personnel who participate in I&M in the 18 PE codes selected for the analysis. In order to develop a more in-depth understanding of the information collected the team next conducted telephone interviews with BLM employees from the overall group of workload survey responders. The major criteria for selection to participate in the telephone interviews was that the member indicated that over 20% of their annual workload was expended conducting I&M in any or all of the PE codes selected for the analysis. The analysis team also selected members for telephone interviews based on unique survey responses to the subjective questions asked in the workload survey, by position (field managers, assistant field managers, and state program leads), or from other I&M subject matter experts. Three members of the analysis team conducted the interviews using an interview protocol and list of standardized questions developed by the analysis team to guide the interview process. The interview questions

are provided as Appendix C. In depth interviews were conducted with over 60 employees, managers, and selected I&M experts. Employees who were interviewed were enthusiastic, willing to help, and demonstrated exceptional knowledge of the I&M process and BLM organizational requirements. The telephone interviews proved to be a valuable source of detailed information.

4.7 Site Visits

The final phase of the analysis was to conduct site visits to selected BLM offices. Team members conducted site visits to locations chosen to provide the best overview of I&M with the BLM and to represent as many BLM states as possible. The intent of these site visits was to further refine the data gathered and to provide an opportunity to meet face-to-face with BLM employees and managers directly involved with I&M. Team members also conducted site visits to other BLM locations based on their unique contributions to the overall I&M effort. These visits occurred at The National Operations Center (NOC), The National Aquatic Monitoring Center, as well as selected state offices. At all of these site visits BLM personnel convened in small groups to discuss details of their I&M activities. The support contractors facilitated the meetings using a prepared presentation coupled with specific questions targeted toward gathering employee's best ideas related to more efficient I&M practices.

4.8 Economic Research

The analysis team conducted an economic analysis to determine baseline costs associated with current I&M activities. The team conducted a detailed review of fiscal year 2006 cost data associated with the 18 PE codes covered by the analysis. The results of the economic research are in section 9.

4.9 Best Practice Research

The analysis team defines best practices as techniques, methods, processes, or activities that are more effective at delivering a particular outcome than any other technique, method, process, etc. More specifically, for the purposes of this analysis best practices are defined as the most efficient (least amount of effort and cost) and effective (best results) ways of accomplishing I&M tasks, based on repeatable procedures that have proven themselves over time in the conduct of I&M activities at different locations. The analysis team's intent was to uncover best practices from within the current BLM organization and also from other organizations at the federal, state, local, or non-governmental level and to develop a means to provide a wider audience within BLM for the potential efficiencies these best practices could generate. This report incorporates many of the best practices we discovered into the recommendations. There is also a general discussion about other agency best practices (see section 8, para 8.1) for use as a reference for how they may apply to current BLM activities. Ideally, each office conducting I&M activities can assess best practices to determine if by their incorporation they would enhance efficiency or effectiveness for their own I&M activities.

5 Assumptions and Constraints

5.1 Assumptions

1. I&M level of activity will increase due to external pressures, particularly from energy permit requirements (oil & gas, solar farms, wind farms)
2. Cost to conduct I&M will increase
3. BLM organizational structure for I&M activities will not significantly change
4. Greater need to address questions about public lands at the national level
5. Current technology is available to address issues with data collection, storage, and sharing
6. Multiple use mandate in Federal Land Policy and Management Act of 1976 (FLPMA) will not change
7. Public and stakeholder interest will increase
8. Multiple partners are available to share the I&M workload
9. Information produced by AIMS is valid
10. Local knowledge and control will remain

5.2 Constraints

1. I&M activities are resource-limited in terms of qualified personnel, funding, equipment, and time
2. Local BLM needs for I&M activity will continue to drive the level of effort in I&M activities
3. NEPA process requires constant and significant level of effort at the local level
4. Climate, geography, and the renewable and nonrenewable resources on public lands dictate planning and conduct of I&M in each field office
5. The scope of the analysis was limited to18 selected Program Element codes

6 As-Is Description of BLM I&M Activities

6.1 Functions

6.1.1 Planning

BLM undertakes extensive land use planning through a collaborative approach with local, State and Tribal governments; the public; and stakeholder groups. The result is a set of land use plans – called Resource Management Plans (RMP) – that provide the framework to guide decisions for every action and approved use on the Nation's public lands and mineral estate. RMPs are used by managers and the public to accomplish the following:

- Allocate resources and determine appropriate multiple uses for the public lands
- Develop a strategy to manage and protect resources
- Establish systems to monitor and evaluate status of resources and effectiveness of management practices over time.

BLM's RMPs are developed using an interdisciplinary approach that considers competing values and uses and weighs long-term benefits to the public against short-term benefits. Developed with extensive public involvement, RMPs are prepared in

conjunction with an analysis of environmental impacts to increase public understanding of the decision-making process and disclose the anticipated consequences of plan decisions.

Local offices also conduct organizational level planning to coordinate and direct the efforts of specialists who are conducting I&M. Done properly, these planning efforts consume considerable resources yet yield significant returns by establishing goals and priorities for specialists to allocate their time toward completing the mission. Where planning is lacking, local offices face difficulties in meeting established I&M requirements. Planning documents found in BLM that impact I&M include:

- Resource Management Plans – Extensively used throughout the Bureau
- District Monitoring Plans – An older planning document not used very much today
- Program Plans – Provide work and guidance for a specific program
- Local (field office) Plans – Lay out I&M and other work requirements needed to achieve local goals

6.1.2 ID Team Formation

At the local level (field office) interdisciplinary (ID) teams are formed from the existing staff of scientists and specialists to collaborate on assessment, inventory, and monitoring activities. The ID team concept facilitates developing an integrated ecological view of the local lands. It is not without drawbacks, however, as there is sometimes disagreement among the team members that slows the work and the assessment, causing assessment and monitoring to proceed at a slower pace. This, of course, makes it more difficult to cover the acreage required.

6.1.3 Data collection

Data collection is most often done by scientists and technicians who are on the ground with direct observation of resources. Some local offices also collect data using imagery from remote sensing sources or by using imagery available from other agency's databases. While many FOs have acquired some data collection devices and are using available technology, much data collection is still done manually and recorded using pen and paper forms. When technology is used, electronic devices such as Trimble units, PDA's, or Tablet PC's are employed. Data collection is often a slow and painstaking process. GPS tools are generally used to georeference the data being collected.

6.1.4 Data Storage

Data storage is a combination of hard copy pencil and paper files and entry into GIS systems. Most field offices have a GIS specialist who works with the specialists who have collected data to enter it into the field office GIS system, which sometimes is part of a state BLM GIS system. Data is not often stored digitally, although, there are some individual efforts to do so, as well as some field offices that have developed sophisticated databases. There is a nascent National Invasive Species Management Information System (NISMIS) which is a pilot for collecting data digitally at the field level and immediately electronically populating a national data base. Other agencies field similar

national-level databases as well, some used by BLM personnel for both entry and retrieval of relevant data.

6.1.5 Data Analysis

Data analysis is typically done months after the data is collected and stored by the scientist who collected the data, most commonly in the winter months. The results of the analysis are commonly stored in hard copy at the field office site and used by field management to make planning and resource allocation decisions.

6.1.6 Effectiveness Monitoring

Effectiveness monitoring is intended to determine if management actions are achieving the objectives of the land-use plan by measuring status and trends of selected resources.

6.1.7 Implementation Monitoring

Implementation monitoring is intended to determine if the land use, usually of grazing allotments or oil & gas permits, is being carried out in an ecologically acceptable and beneficial manner.

6.1.8 Report Generation

Reporting is a key component of I&M. Reports are generally developed by the scientist who collected and analyzed the field data. Local reports are normally filed in hard copy and are generally only used for local management decisions. As efforts are now emerging to assess and monitor by regions, local reports are beginning to be reviewed on a regional or state-wide basis.

The National Environmental Policy Act of 1969 (NEPA) requires BLM to complete detailed reports when considering certain actions related to public lands. NEPA mandates a decision making process that requires the collection and reporting of data and information to support NEPA decisions. NEPA requires agencies to follow a three-step review process:

- Conduct a preliminary screening for NEPA's applicability (NEPA is not required for proposed actions that are considered "categorical exclusions," for example);
- Prepare an Environmental Assessment (EA) to determine whether an Environmental Impact Statement (EIS) is required; and
- Prepare an EIS if required (an EIS is required if a proposed action may "significantly affect the quality of the human environment").[4]

For BLM, developing or revising an RMP automatically requires an EIS. Amending an RMP requires an EA, and may or may not require an EIS. BLM must prepare a Record of Decision (ROD) for all EISs. In part, the ROD states decisions and the alternatives considered (including specifying the environmentally-preferable alternative).

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[4] BLM National Webpage, NEPA

Frequently, local offices use standing ID teams for reviewing NEPA documentation. The NEPA process demands detailed documents in specific formats and often requires a large investment in time and involves the participation of many disciplines to properly prepare and thoroughly review the NEPA reports.

6.1.9 Land Use Determination

The Federal Land Policy and Management Act of 1976 (FLPMA) requires that BLM manage public lands in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values and that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use. This guidance drives managers when making land use determination decisions in regards to public lands.[5]

6.1.10 Land Health Assessment

Land Health Assessment is a national program that requires the field offices to assess their lands on a one-time basis according to a prescribed set of standards to report on the ecological health of those lands. The program is responsive to national information needs. It is very useful but it does consume most monitoring human and time resources. It provides a point-in-time view but does not facilitate monitoring trends in land health.

6.2 Available Resources

Resources currently available to the BLM with which to conduct inventory and monitoring include:

6.2.1 Workforce

The BLM uses a combination of employees, contractors, partners, and volunteers to accomplish I&M activities. The seasonal nature of I&M work (it can only be accomplished during favorable field conditions) allows the BLM to take advantage of part time, seasonal, temporary, and student employment statuses, thus maximizing the dollars available for hiring a workforce. Many BLM field offices rely on contractors to varying degrees to accomplish their I&M work. The use of contractors reduces the time BLM managers need to spend on overhead functions such as training, equipping, and supervising personnel. Partners from both the public and private sector are used throughout the BLM to support I&M activities. Most BLM offices have active agreements with partner organizations to collect and share I&M data. Volunteers, where available, are used to accomplish I&M work. The significant investment in recruiting, training, and oversight of volunteers makes their use less desirable in some cases.

6.2.2 Funding

BLM's funding in FY06 for I&M in the 18 PE codes covered by this analysis was $57,814,577 (discussed in detail in section 9, para 9.1). This amount covered labor, contracts, and agreements.

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[5] Federal Land Policy Management Act of 1976 *As Amended*, (October 2001) 1-2.

6.2.3 Time

Generally, most BLM employees involved in I&M activities indicate they need more time to do all of the I&M work they feel needs to be done. As a result of other priorities and ancillary duties, they are not able to devote all the time necessary to I&M tasks, especially field data collection. Only the minimal required I&M work gets accomplished at many field offices.

6.2.4 Equipment and Technology

The BLM uses a variety of high and low tech equipment when carrying out I&M work. Equipment ranges from paper & pencil to the most modern data recorder with integrated GPS and GIS software. There is no standard "tool kit" for I&M work and each individual and office are free to use whatever equipment they need as long as it fits within the constraints of their program and budget.

We uncovered many uses of technology in performing I&M functions within the BLM. These included methods for collecting, storing, analyzing, retrieving, and sharing data. Some offices within the BLM are conducting research on faster, less expensive data collection methods. Some of the technology currently being used by the BLM includes:

- Data Collection Devices – Several varieties of Trimble data recorders and other PDA's are used throughout the BLM. Depending on the sophistication of the device they can include a GPS capability, be preloaded with customized data collection screens, and provide an upload capability into a GIS.
- Satellite Imagery – Satellite pictures can assist in certain types of I&M, usually associated with vegetation cover. While limited to the level of detail provided, this method is used in many locations.
- Software to link collected data to a storage system/database – Much of this is locally developed software which takes field data and enters it into a database such as a GIS.
- Aerial Photography – The use of low level aerial photography for I&M is being investigated by at least two different BLM offices. This technology combines high resolution photography and low flying manned and unmanned aerial platforms to produce photographs of land plots with enough detail to perform I&M analysis. This capability is not yet being used for operational I&M but provides a potentially significant enhancement to the way I&M is conducted.

6.3 Guidance

BLM is governed by external guidance in the form of regulations, policies, and federal, state, and local laws which apply to BLM-managed public lands. Specific court decisions may also have relevance to BLM operations and must be adhered to when applicable. BLM also has developed internal Manuals, Handbooks, Information Bulletins (IB), Information Memorandums (IM), Technical References, and other management documentation designed to guide employees as they comply with external guidance.

6.3.1 BLM Manuals

BLM Manuals contain BLM policy and program direction. They provide policy, procedures, and instructions to manage programs. Each BLM Handbook is controlled by a Manual Section which sets out the basic authority for performing tasks and states who bears the ultimate responsibility for seeing that these tasks are accomplished. BLM Handbooks are the source of detailed instructions for performing specialized procedures to carry out policy and direction described in the Manual Section.[6]

6.3.2 BLM Handbooks

BLM Handbooks provide specific detailed instructions, techniques, procedures, practices, and processes. Handbooks do not contain broad objectives, policies, assignment of responsibilities, or delegations needed primarily by line officials and principal staff officials to administer programs. Handbooks are considered part of the Manual. They have the same force of authority as the Manual Section.[7]

6.3.3 BLM Instruction Memoranda

Instruction Memoranda (IM) are temporary directives that supplement the Bureau Manual Sections. IM's:

- contain new policy or procedures that must reach BLM employees quickly
- interpret existing policies, or
- provide one-time instructions

They are issued only when urgency compels release of a directive before the information can be incorporated into a Manual Section or when the issue treated is a one time occurrence. There are two kinds of IMs -- WO (National) which apply to all of BLM and Director's Office (DO) which apply only to Washington Office operations.[8]

6.3.4 BLM Information Bulletins

Information Bulletins (IBs) are temporary directives that supplement the Bureau Manual Sections. IB's disseminate information of interest to BLM employees. They do not contain new BLM policy, procedures, or instructional material. They may:

- call attention to existing policies or procedures
- transmit material such as publications and announcements
- require an action or response from BLM officials such as confirming attendance at meetings, commenting on draft documents, or providing requested information

There are two kinds of IBs -- WO (National) which apply to all of BLM and Director's Office (DO) which apply only to Washington Office employees.[9]

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[6] BLM National Webpage, Laws, Regulations, and Policies, BLM Manual
[7] BLM National Webpage, Laws, Regulations, and Policies, BLM Handbook
[8] BLM National Webpage, Laws, Regulations, and Policies, BLM Instruction Memoranda
[9] BLM National Webpage, Laws, Regulations, and Policies, BLM Information Bulletins

6.3.5 Technical References

Technical References may be produced as a collection of related documents about one subject and issued under a single BLM subject code. Although the information contained in a Technical Reference cannot establish policy, it can become policy through subsequent issuance as a directive, such as an Instruction Memorandum from Washington or a BLM Manual Section.[10]

6.3.6 Other Guidance

Individual state offices and program areas may also augment existing guidance with documentation specific to their areas of responsibility. These state and local BLM requirements can vary in complexity and are subject to updates via IM's, IB's or in some cases email. Ultimately there are multiple possible sources of mandatory guidance that guide the conduct of I&M activities which increases the possibility that newly issued guidance will conflict with current established procedures. It is incumbent on all employees who are participating in I&M activities to know and understand all the current guidance that regulates the conduct of their actions in order to maintain standardization in the way I&M practices are carried out. Failure to do so can expose the BLM to increased litigation and increased chances of negative outcomes during these litigation events.

6.4 Partnering Relationships and Opportunities

Partnering relationships are essential to BLM's conduct of assessment, inventory, and monitoring. They enable BLM specialists to collect and analyze more data on their lands than they could by themselves. They bring more resources in terms of money, subject matter expertise, time, technology, and data that has previously been collected by others on BLM lands. Working with partners is something that varies greatly across the West. It is often dependent on the personalities and desires of individual field office managers and their staffs. Partners range from universities such as Northern Arizona and Utah State to other federal agencies, both within DOI (National Park Service, Natural Resource Conservation Service, Fish & Wildlife Service, USGS) and outside (USDA Forest Service, Agricultural Research Service, Department of Energy national laboratories), to the many state natural resource departments, to non-governmentals (The Nature Conservancy), to local advocacy groups, and more, such as individual permittees (ranchers and oil & gas companies).

There are instances where partners bring money to BLM activities, such as the National Aquatic Monitoring Center and request that BLM perform certain monitoring or assessment activities for them. That monitoring data and analysis belongs to BLM even though someone else paid for it. There are other examples, such as at the Carlsbad, NM field office, where BLM pulls together a team of partners that then enables BLM to get a substantially lower price for a contractor to do certain work, such as aerial treatment of rangelands, because the contractor can treat the various partners' contiguous and integrated lands in single passes rather than having to stop and start on only BLM lands. Partners also bring their own highly-qualified scientists to work with BLM personnel

[10] BLM NOC Library Website, Technical Reference

engaged in inventory and monitoring. Some of the partners, such as NRCS, are the primary source of scientists that BLM has in short supply, such as soil scientists.

6.5 Training

Training is varied ranging from formal in-house staff training at the BLM National Training Center in Phoenix to training provided to field office scientists by subject matter experts from BLM state office and national sources (such as the National Aquatic Monitoring Center) to on-the-job training provided at field offices for seasonals, interns, and volunteers. BLM does not have a standard, mandatory training program for personnel performing I&M functions. Most I&M training for new employees is accomplished on an "on-job-training" or "apprentice" basis. Refresher training for full-time and returning seasonal employees is dependent on the field office priorities and resource availability.

6.5.1 Student Educational Employment Program (SEEP)

BLM has a Student Educational Employment Program (SEEP) which has two components: (1) Student Temporary Employment Program (STEP) and (2) Student Career Experience Program (SCEP). STEP appointments are temporary, and do not typically exceed one year. SCEP offers work experience directly related to the student's academic program and career goals, and also gives students the opportunity for conversion to permanent employment upon graduation. Field offices vary greatly in their use of these programs. Some will not use them at all because they do not have the resources to train the students to do inventory and monitoring work. Others make widespread use of the programs. A STEP student is referred to as a temporary employee. A STEP student fulfills temporary monitoring needs of the field office for a one-year appointment or less. BLM may extend the appointment in one-year increments. Once STEP students receive initial informal, field office-provided training in data collection for monitoring purposes, they are often useful for more than one year. SCEP places college students in paid, career-track internship positions that closely match their college majors. Training requirements are generally less because the SCEP students are college-trained in the area in which they are working. SCEPs are on a multi-year program and may convert directly to fulltime BLM employees upon graduation.

6.5.2 Seasonals

Seasonals. BLM field offices use a variety of other temporary employees. The Re-employed Annuitant program brings retired BLM specialists back to their field offices for part-time work. They normally do not require training except that necessary to enhance their technological skills. A number of field offices use the Chicago Botanical Gardens internship program which brings them newly-graduated college students for one 6 month stint. These interns are more highly qualified than STEPs or SCEPs but they normally are provided OJT by the local field office for a few days before they go out into the field as data collectors.

6.6 Current Barriers to Efficiently Conducting I&M Activities

During the analysis, it became apparent that certain barriers prevented the BLM from conducting I&M in a more efficient manner. These barriers were found in the areas of resources, training, technology, culture, and guidance.

6.6.1 Resources (Staffing, Equipment, Funding)

When asked if sufficient resources are available to conduct I&M work, most BLM employees stated that more people and time are needed to effectively carry out their I&M mission. Full time employees have many ancillary duties that compete for their time to perform I&M work and as a result report that they do not accomplish all of the I&M work they feel is necessary. Lack of the proper equipment was not considered an obstacle to performing I&M however this analysis did show that modern, high tech gear is not widely used in the Bureau in carrying out I&M functions. Additional funding for staffing and equipment could alleviate shortages and improve the amount and quality of I&M data. However, the BLM budget for I&M is declining and is not expected to improve in the near future. This means maintaining the current level of I&M will be difficult without improved methods and processes.

6.6.2 Training

BLM does not have a standard, mandatory training program for personnel performing I&M functions. Most I&M training for new employees is accomplished on an "on-job-training" or "apprentice" basis. This provides the employee with the methods and procedures used by the local office to satisfy various I&M requirements but does not necessarily provide a BLM-wide standard for performing I&M. Refresher training for full-time and returning seasonal employees is sporadic or non existent. Almost no documentation exists showing that employees received training making it hard to verify that an employee knew the proper procedures. Lack of standard, mandatory, documented initial and refresher training makes it difficult for the BLM to establish that employees were qualified to perform I&M tasks. This can be particularly harmful when defending the validity of collected data during litigation.

6.6.3 Use of Available Technology

As an agency, the BLM has not adopted and funded a standard technology for collecting and storing I&M data. As a result, field offices do not have the budget to acquire the latest devices and systems which would enhance the conduct of I&M activities. Since there is no central clearing house to make technology enhancements known throughout the BLM, a wide variety of non-compatible equipment and systems is used which generally does not allow for efficiency in collecting and sharing data. Another reason newer technology is not used for inventory and monitoring is the tremendous cost and effort involved in inserting high tech solutions into low tech legacy programs. In these cases, changing the methodology could make it difficult to compare newly collected information with the existing historical data.

6.6.4 Cultural Mindset

I&M is typically viewed as a local activity to satisfy a program or allotment need. Individuals do not expect the data they collect to be used beyond the specific requirement they are fulfilling. There does not seem to be much enthusiasm outside of the Washington Office (WO) and the National Operations Center to standardize I&M methods or create a national database of I&M data. Additionally, many senior level employees resist the insertion of technology and new procedures into the I&M process.

6.6.5 Guidance

Guidance covering I&M procedures is available from many sources. In addition to BLM handbooks and regulations, many State Offices put out I&M guidance and most programs have guidance on how, when, and where I&M will occur. While it is understood that local and program guidance is needed to satisfy specific objectives, it is important to ensure that the various levels of guidance are compatible and augment each other. Periodical review and updating of existing I&M guidance at all levels will avoid conflicting information on how data is collected and analyzed. The more standard the guidance, the stronger and more justifiable the data collected following that guidance.

6.7 External Impacts on I&M Activities

During the course of this analysis we tried to determine how certain conditions/events/situations would impact the conduct of I&M activities. Specifically, BLM employees were asked if the level or method of I&M changed as a result of the following:

- Drought – For the most part, respondents didn't feel there was any significant modification to their I&M work during drought conditions. The analysis of I&M data collected showed different conditions as a result of the drought, but the frequency and method of I&M remained constant. There were no reports that the drought caused a shift of priorities to drought-related matters and away from I&M activities, thus reducing the amount of I&M conducted. In one instance it was mentioned that vehicles may be restricted from going into certain areas because of extreme fire conditions brought on by a drought, but that only postponed the I&M activity, it did not modify or cancel it. A drought has no specific impact on the conduct of I&M activity.
- Fire – As expected, the amount and focus of I&M changes in a recently burned area. Following a fire, increased I&M is conducted to determine the type and effectiveness of rehabilitation and restoration efforts. I&M projects scheduled prior to the fire may have to be cancelled or postponed due to the higher priority post fire requirements or because the fire destroyed the habitat to be monitored.
- Outdoor recreation – When a land use decision is made that causes restrictions to be placed on an area previously open to the public for recreation, the BLM must initiate compliance monitoring to ensure the new restrictions are being followed.

7 Workload Survey

7.1 Overview of Survey Process

The analysis team developed the workload survey to gather detailed information from BLM employees about the extent of their I&M activities in the 18 PE codes included in the analysis. It was developed in an Excel workbook format with a cover page and then an individual worksheet for each of the PE codes.

The analysis team developed a list of nine discreet questions that were applicable to each of the PE codes under study. These questions were vetted with I&M experts to ensure they would gather information that would support the objectives of the analysis. The questions targeted workload in planning for I&M activity, in collecting I&M data, and in managing the data in terms of recording, storing, and sharing of the data that was collected. Additionally, subjective questions were asked on each survey page asking specifically about use of shared databases and about anticipated changes in I&M workload for the next year to account for variations in workload from that collected via the survey.

The analysis team created a random sample of 947 I&M practitioners who were asked to complete the survey. The random sample was chosen from over 4000 employees on the BLM employment list as of April 2008 who were likely to perform I&M activities in any of the selected PE codes in the analysis. We used a confidence interval of +/- 2.8 with a confidence level of 95% that our sample would faithfully represent the population of 4000. The team then created a stratified random sample according to the labor categories that perform I&M work. Table 7.1 shows the categories and the sampling data. The workload survey was uploaded to the BLM intranet on both the Competitive Sourcing and WO-200 webpages. An informational email announcing the workload survey was then sent to each employee who had been selected to participate in the survey. This email also contained detailed instructions and an All-employee memorandum from Henri Bisson explaining the intent of the survey and showing support for the analysis process and workload survey from senior leadership within BLM. The analysis team received workload survey responses from 423 of the 947 employees who were initially asked to complete the survey.

Table 7.1 Stratified Random Sample

Labor Category	Sample Data	
Confidence Level = 90%		
	Sample Size	**Error**
Archeologist	52	10%
Biologist	58	10%
Botanist	33	10%
Ecologist	26	10%
Environmental Protection Specialist	41	10%
Field Manager & Asst FM	51	10%
Forestry Technician	51	10%

Forester	52	10%
Geologist	50	10%
GIS/Remote Sensing Specialist	33	10%
Hydrologist	35	10%
Natural Resource Specialist	57	10%
Other	37	10%
Outdoor Recreation Specialist	53	10%
Physical Scientist	33	10%
Range Management Specialist	56	10%
Range Technician	57	10%
Soil Scientist	22	10%
Weed Specialist	2	10%
Wilderness Specialist	6	10%
Realty Specialist	55	10%
Planning & Environment Coordinator	37	10%
Petroleum Engineer	50	10%
Total	947	

7.2 Statistical Analysis of Data Received

Initially, we examined the responses by state. This information can be found in Table 7.2 below. We achieved a return of 423 out of 947 surveys sent out. That provided us with a 95% confidence level at an error of 3.5%.

Table 7.2 Responses to survey by state

Total State Surveys Returned			
State/Office	**Tot Sampled**	**Tot Received**	**% Completed**
Alaska	53	40	75%
Arizona	51	14	27%
California	81	8	10%
Colorado	66	16	24%
Virginia	11	1	9%
Idaho	57	25	44%
Montana	52	24	46%
Nevada	87	28	32%
New Mexico	99	25	25%
Oklahoma	1	1	100%
Oregon	247	165	67%
Utah	48	29	60%
Washington	3	3	100%
Wyoming	77	37	48%
National Ops Center	13	6	46%
National Training Center	1	1	100%
Totals	**947**	**423**	**45%**

Table 7.3 shows the same responses broken down by labor category. These are not exactly the same as in Table 7.1 because respondents were asked to identify their own labor category.

Table 7.3 Total Responses by Labor Category

Labor Category	Responses
Archeological Technician	1
Archeologist	18
Biological Technician	5
Biologist	8
Botanist	12
Ecologist	13
Environmental Protection Specialist	9
Field Manager	14
Field Manager, Asst	5
Fishery Biologist	3
Fishery Tech	1
Forestry Technician	22
Forester	34
Geologist	17
GIS/Remote Sensing Specialist	11
Hydrologist	18
Hydrology Tech	3
Natural Resource Specialist	18
Other	51
Outdoor Recreation Specialist	11
Recreation Tech	2
Physical Scientist	7
Range Management Specialist	24
Range Technician	16
Soil Scientist	12
Wildlife Tech	1
Weed Specialist	2
Wildlife Biologist	16
Wilderness Specialist	1
Realty Specialist	19
Planning & Environment Coordinator	11
Mismarked/Not marked	38
Total	**423**

Next the survey team had to identify all the surveys for "0" responses. There were a significant a number of specialists and managers who provided excellent responses with extensive textual comments, but they had not recorded any hours in one or more of the 18

Automotive Technician	1
Carpenter	18
Diagnostic Technician	5
Electrical	2
Engineer	1
Estimator	13
Explosive Ordnance Disposal	2
Field Manager	14
Field Manager, Asst.	2
Forestry Biologist	2
Forestry Tech	1
Forestry Technician	22
Foreman	14
Geologist	17
GIS Forestry Planning Specialist	11
Hydrologist	14
Hydrology Tech	2
Indian Reading Specialist	1
Other	32
Outdoor Recreation Planner	11
Restoration Tech	2
Surveyor Assistant	7
Surveyor Party Chief	24
Surveyor Technician	13
Tool Inventor	12
Wildlife Tech	1
Wildland Firefighter	2
Wildlife Biologist	16
Maintenance Specialist	1
Ranger Specialist	15
Recreation & Conservation Specialist	11
Volunteer Coordinator	28
Total	261

PEs in the previous 12 months. Table 7.4 shows the responses received by state that did record time spent performing I&M in the 18 PEs.

Table 7.4 Survey Responses with I&M time recorded

Non-Zero Survey Roll-Up			
State/Office	Total Sampled	Total Received	% Completed
Alaska	53	8	15%
Arizona	51	7	14%
California	81	4	5%
Colorado	66	9	14%
Virginia	11	1	9%
Idaho	57	15	26%
Montana	52	17	33%
Nevada	87	15	17%
New Mexico	99	12	12%
Oklahoma	1	0	0%
Oregon	247	81	33%
Utah	48	11	23%
Washington	3	1	33%
Wyoming	77	10	13%
National Ops Center	13	6	46%
National Training Center	1	1	100%
Totals	**947**	**198**	**21%**

Table 7.5 shows the same responses broken down by labor category.

Table 7.5 Responses by labor category, total and non-zero

Labor Category	Responses	
	All	Non-zero
Archeological Technician	1	0
Archeologist	18	2
Biological Technician	5	4
Biologist	8	7
Botanist	12	11
Ecologist	13	11
Environmental Protection Specialist	9	4
Field Manager	14	5
Field Manager, Asst	5	2
Fishery Biologist	3	2
Fishery Tech	1	1
Forestry Technician	22	2
Forester	34	11

Geologist	17	1
GIS/Remote Sensing Specialist	11	4
Hydrologist	18	18
Hydrology Tech	3	3
Natural Resource Specialist	18	11
Other	51	8
Outdoor Recreation Specialist	11	0
Recreation Tech	2	0
Physical Scientist	7	0
Range Management Specialist	24	21
Range Technician	16	8
Soil Scientist	12	8
Wildlife Tech	1	1
Weed Specialist	2	2
Wildlife Biologist	16	15
Wilderness Specialist	1	1
Realty Specialist	19	0
Planning & Environment Coordinator	11	1
Mismarked/Not marked	38	34
Total	**423**	**198**

7.3 Survey Summary

An analysis of all the task responses in each survey can be found in Table 7.6. It shows the hours spent on each of the I&M survey tasks. It also groups the individual tasks into four I&M functional areas (planning, data collection, data analysis and reporting, and research) and shows the hours (subtotals) dedicated to each of these subgroups. The respondents with non-zero surveys, represented the population at a 95% confidence level with an expected error of 6.2%, certainly acceptable. The survey respondents indicated they spent 134,643 hours doing I&M work for the 18 PE's. This represented an average per year of 680 hours per specialist or 38% of their time. It should be noted that many of these specialists do charge I&M work to other PE codes, as well. The follow-up field interviews found that, on average, most I&M specialists dedicate about 50% to I&M tasks of one type or another. See Table 7.6 below for details.

The breakdown of time spent on I&M activities shown in Table 7.6 generally reflects the findings of our interviews and site visits and is in line with what we heard a reasonable distribution of time would look like (e.g., 20%-planning, 42%-data collection, 32%-analysis and reporting). Several of the recommendations we discuss in section 10 of this report deal with the creation of easily accessible data bases to store I&M information. If these recommendations were to be implemented, we would expect to see the time involved in researching existing data (currently 6%) increase. Conducting more I&M analysis through research of existing data could result in a decrease in time spent conducting data collection.

Table 7.6 Tasks – All 18 PEs

Tasks - All PE's		Hours	Per Cent
PLANNING			
a. Plan for Program Element I&M activities.		26,838	
	Subtotal	**26,838**	**20%**
DATA COLLECTION			
b. Establish monitoring plot or location on the ground for data collection.		10,082	
c. Collect data physically by doing direct field measurement.		41,342	
d. Collect data by employing remote sensing/photo interpretation.		5,701	
	Subtotal	**57,125**	**42%**
DATA ANALYSIS AND REPORTING			
e. Clean up data or forms if necessary and download PDA-collected data.		4,065	
f. Enter data into an electronic database.		7,824	
g. Summarize (including interpretation and analysis) and report on data collected.		14,679	
i. Prepare reports.		16,247	
	Subtotal	**42,815**	**32%**
RESEARCH EXISTING DATA			
h. Research, analyze, and summarize legacy data - (historic BLM/other agency data)		7,865	
	Subtotal	7,865	**6%**
	Grand Total	**134,643**	**100%**
	Average I&M hours	**680**	**38%**

8 Other Agency Best Ideas for Inventory and Monitoring

8.1 Other Best Ideas

There are many other Federal, State, Local, Non-governmental, and volunteer organizations that are also conducting I&M activities, many times in alliance with BLM. When applicable, best ideas and best practices from these other organizations may prove useful and offer improvements in efficiency or effectiveness of I&M operations if adopted by BLM. Several of these best practices are detailed below as a sample of other possible solutions to management challenges faced by BLM personnel.

8.1.1 The Arizona Strip Cooperative Rangeland Monitoring Program

The Arizona Strip Cooperative Rangeland Monitoring Program is an ongoing and cooperative effort undertaken by both the BLM Arizona Strip district office and the University of Arizona – Mohave County Cooperative Extension. The objectives of the program are to:

- Assist implementation of monitoring studies on the BLM Arizona Strip District
- Compile and summarize past and present monitoring data
- Evaluate monitoring methods for adequacy and consistency
- Increase the ability of BLM permittees to conduct or assist with monitoring studies

The program is now in its fifth year of operation and has completed over 5800 studies at 436 monitoring sites. One of the key contributions of the cooperative program is the development of the Vegetation/GIS Data System. Development of the VGS software application began in 2005. It is being developed to support the mission of the program with the following objectives:

- Provide a centralized database for organizing and managing all data, photos, documents, positional coordinates and other information associated with rangeland monitoring efforts on the BLM Arizona Strip District.
- Provide electronic tools to assist with locating existing study areas, data recording and summary and presentation of results both in the field and the office.

Specific capabilities and the design of VGS generally meets the needs of both field and management level personnel due to its development heritage involving both field and office requirements. One reason for the success of the VGS software is that both office and field data entry forms are designed to fit specific combinations of sampling methods, rather than requiring the user to switch between forms for each method used by a sampling protocol. Also, forms are designed to minimize the amount of writing, clicking and scrolling that must be performed to enter data and navigate a form. VGS is built on the Microsoft .Net Framework and is written mostly in the C# language. VGS operates on any computer or device using a Microsoft Windows™ operating system - specifically

Windows XP Service Pack 2 or later, Windows Server 2003 Service Pack 2 or later, or Windows Vista. Tablet PCs using equivalent "Tablet Editions" of these operating systems are recommended for use in the field. Criteria established as guidance for development of VGS are as follows:

- Centralized Database
  - Ability to store data collected using a variety of sampling protocols including historical data.
  - Ability to store or manage photos, diagrams and documents
  - Accessible to GIS applications.
  - Suitable for field, office or on-line applications

- Field Tools
  - Provide data entry mechanisms at least as quick and easy as paper forms or other means used for recording data.
  - Provide a "Field Office" environment.
    - All maps, documents, photos and historical data should be available for review in the field as well as in the office for a designated region.
    - Embedded GPS and GIS tools should be available (These requirements directed implementation toward tablet PCs rather than PDAs, though the VGS framework can support development of partial PDA implementations.)

VGS software currently includes the following capabilities:

- Database for use both in the office and in the field.
- Forms for entering existing historical data and for recording new data in the field for principle monitoring protocols used on the Arizona Strip (as well as some in use elsewhere).
- Limited integrated GPS capabilities (for supported GPS devices).
- Ability to filter and search for study areas based on various classification systems.
- Basic reports for summarizing and presenting data for the protocols currently supported.
- Basic GIS links.

Capabilities under development include:

- Ability to automatically synchronize data, photos and documents between multiple field devices and a central server.

Capabilities planned for the future (subject to future funding) include:

- Ability to manage and view photographs and documents.
- Embedded GIS capabilities.

- User designable/configurable field and data forms.
- Partial PDA implementations (low priority at this time because tablet PC implementation is proving to be preferable).

8.1.2 National Park Service (NPS) Inventory & Monitoring Program

Although it is a sister service within the Department of Interior, the NPS I&M Program is organized very differently from that of the BLM, owing in part at least to the very different basic bureau organizations based on state (political) boundaries and park autonomy. The missions are also considerably different, in that the NPS is focused on resource stewardship necessary to maintain park resources "unimpaired for the enjoyment of future generations," while the BLM is focused on resource stewardship and productive use of the land, with a lesser orientation on "enjoyment." Nonetheless, a look at the NPS I&M organizational experience can generate some "best ideas" that could find use in BLM's lexicon.

***Monitoring* Natural Resources in the National Parks**

The NPS has initiated a long-term ecological monitoring program, known as "Vital Signs Monitoring", to provide the minimum infrastructure needed to track the overall condition of natural resources in parks and to provide early warning of situations that require intervention. The scientifically sound information obtained through this systems-based monitoring program will have multiple applications for management decision-making, park planning, research, education, and promoting public understanding of park resources.

Park vital signs are a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, known or hypothesized effects of stressors, or elements that have important human values.

Inventory and Monitoring *Networks*

The key to the NPS I&M Program is the set of networks that have been organized across the nation with funding and staffing primarily coming from the national level, not the individual parks. To facilitate collaboration, information sharing, and economies of scale in I&M, the NPS has organized more than 270 parks with significant natural resources into 32 ecoregional networks to conduct expanded inventory and monitoring activities. Each network supports a core, professional staff who conduct the day-to-day activities of the network and who collaborate with staff from network parks and other programs and agencies to implement an integrated long-term program to monitor the highest-priority vital signs.

Network staff are involved in numerous activities and functions, such as collecting data in the field; organizing and cataloging data; performing data analysis, synthesis, and modeling; and providing data and expertise to park planners. Network personnel are also occasionally called upon to provide data and expertise for resource assessments and resource stewardship strategies, and to contribute to performance reporting. Monitoring plans are "network monitoring plans," not individual park monitoring plans.

Inventory and Monitoring Data Management

Data and information are the primary products of natural resource inventories and ecological monitoring. Data management systems and procedures have been developed by the National I&M Program and each of the 32 networks with the objective of ensuring data quality, security, longevity and availability. Comprehensive data management plans accompany network monitoring plans, which provide specific guidance on how data resulting from inventory and monitoring efforts will be acquired, processed, checked, analyzed, distributed, and archived.

Finally, the responsibility for I&M rests with the dedicated 32 networks and the national I&M Program, not the individual park superintendents.

8.1.3 DoD, Fort McCoy Wisconsin

Located in the heart of the upper Midwest, Fort McCoy is a 60,000-acre installation fully capable of supporting training throughout a four-season climate. Fort McCoy provides a full spectrum of facilities, ranges, training areas and classrooms that support individual and collective training compatible with environmental standards. The installation features 27 firing and maneuver ranges, an 8,000-acre impact area and airborne drop zones for both personnel and equipment. Fort McCoy has a scientific staff dedicated to I&M to ensure the viability of the natural resources on the Post's federal lands due to the amount of training that is conducted there annually. Best practices applied at Fort McCoy that may be of use/interest to BLM personnel include:

- Hire trainable college students when available
- Partner with universities for large research projects
- Avoid highly trained individuals due to cost
- Utilize GIS for all aspects of Inventorying & Monitoring, such as,
    - Assessment/analysis
    - Mapping
    - Planning
    - Habitat Study
    - Data Distribution
- Utilize Executive Summaries whenever possible
    - Invaluable tool – require every Program Manager to write Executive Summaries annually
    - Executive Summary encompasses number of man hours on each project, dollars necessary for completing each project, and best practices learned by staff when different approaches were implemented. The Executive Summary also includes the historic and the current Range and Training Land Assessment information.
    - These are particularly valuable tools when an employee retires or leaves because a person unfamiliar with the project can quickly review and get up to speed

9 Cost Analysis

Information to conduct a cost analysis for this study was obtained from various BLM financial databases. The data provided was from Fiscal Year 2006 (FY06). Two categories of financial data were analyzed - labor costs and contract & agreement costs. The data was filtered to include only costs associated with the 18 program element (PE) codes that encompass this study. It is assumed that all charges to the 18 PE codes are related to I&M activities. The financial data was entered into Excel spreadsheets so that it could be further examined and manipulated to respond to future needs for cost information.

9.1 I&M Baseline Costs

Baseline costs indicate the current cost to BLM of conducting I&M activities within the 18 PE codes. Baseline costs include labor and contracts & agreements for a variety of products and services to support the I&M function. The baseline cost for FY06 is $57,814,577 This is shown in Tables 9.1 and 9.2 below.

Table 9.1 Baseline Expenditures by Program Element – FY06 Data

PE Code	Program Element	Labor	Contracts & Agreements
BN	INVENTORY WATER RESOURCES	1,583,810	775,532
BP	ASSESS WATERSHEDS	4,389,797	625,598
BR	INVENTORY SHRUB/GRASS/PJ VEG	415,360	429,585
BS	INVENTORY FOR INVASIVE/NOXIOUS WEEDS	1,815,795	596,963
BT	INVENTORY FOREST/WOODLAND VEG	2,007,484	0
CB	INVENTORY PLANT/WILDLIFE HABITAT	5,272,219	2,781,157
MB	EVALUATE FOREST/WOODLAND TREATMENTS	647,644	231,281
MI	MONITOR AIR RES/CLIMATE CONDITIONS	398,185	485,404
MJ	EVALUATE RANGELAND HEALTH	6,264,522	588,326
MK	EVALUATE WEED TREATMENTS	674,700	66,745
MN	MONITOR LAKE/WETLAND HABITAT	810,968	107,316
MO	MONITOR STREAM/RPRN HABITAT	4,029,264	1,004,139
MQ	MONITOR TERRESTRIAL HABITAT	3,458,306	1,542,755
MR	MONITOR SPECIES POPULATIONS	6,701,289	4,480,436
MT	MONITOR FUELS TREATMENTS	602,730	911,500
MU	MONITOR WATER RESOURCES	1,527,766	1,098,807
MX	MONITOR SHRUB/GRASS VEG TREATMENTS	175,279	276,457
MZ	MONITOR POST-FIRE STABILIZATION/REHAB	677,785	359,671
	BLM TOTAL	**41,452,905**	**16,361,672**

Table 9.2 Baseline Expenditures by State – FY06 Data

State/Activity Code	State/Activity	Labor	Contracts & Agreements
AK	ALASKA	1,824,840	1,104,736
AZ	ARIZONA	3,099,832	651,381
CA	CALIFORNIA	3,115,809	916,620
CO	COLORADO	3,350,175	736,578
ES	EASTERN STATES	47,022	17,889
FA	FIRE & AVIATION	0	310,600
ID	IDAHO	5,027,626	1,327,858
MT	MONTANA	3,050,223	1,418,942
NM	NEW MEXICO	1,973,440	937,082
NV	NEVADA	2,863,225	1,146,211
OR	OREGON	8,755,974	4,207,525
ST	SCIENCE & TECH CENTER	811,990	140
TC	NATIONAL TRAINING CENTER	91,562	31,854
UT	UTAH	3,443,338	926,288
WO	WASHINGTON OFFICE	127,026	305,786
WY	WYOMING	3,870,823	2,322,181
	BLM TOTAL	**41,452,905**	**16,361,672**

9.2 Other I&M Cost Breakdowns

Tables 9.3 through 9.5 provide different perspectives on the FY06 cost data. They are included to gain a broader perspective of where the BLM I&M dollars are spent.

Table 9.3 Labor Expenditures by PE by State – FY 06 Data

PE	AK	AZ	CA	CO	ES	ID	MT	NM	NV	OR	ST	NTC	UT	WO	WY	PE Total
BN	200,966	150,229	113,075	158,842	242	91,474	85,151	41,018	87,692	166,543	135,724		198,413	3,401	151,040	**1,583,810**
BP	9,065	333,559	176,711	481,218	4,063	198,861	885,115	525,933	392,803	666,828	151,719		226,992	38,536	298,394	**4,389,797**
BR	0	6,008	18,759	33,075		90,711	33,682	864	9,310	92,905	7,746		100,246	500	21,555	**415,360**
BS	43,565	112,414	248,705	96,866	2,056	229,718	124,922	23,595	349,993	335,669			175,179	571	72,542	**1,815,795**
BT	9,204	6,768	132,652	177,883		279,719	176,201	29,175	32,280	946,656	120,035		65,052	358	31,502	**2,007,484**
CB	99,577	224,238	472,868	330,666	27,420	702,517	485,741	323,057	192,118	1,200,472	232,318		427,208	1,772	552,247	**5,272,219**
MB	15,255	5,889	35,224	43,027		95,619	43,664	1,814	15,215	293,168			14,095	775	83,899	**647,644**
MI	269	1,468	23,048	35,231		7,441	357	26,391	60,017	3,629	25,886		129,793	284	84,369	**398,185**
MJ	7,569	900,721	329,949	396,853		974,147	446,912	299,580	457,990	1,003,105	95,333		561,128	12,253	778,982	**6,264,522**
MK	4,619	13,294	117,458	47,221	0	106,859	66,762	8,479	74,914	136,947			66,999	1,877	29,270	**674,700**
MN	907	74,239	66,517	145,784		19,090	37,277	12,578	95,807	105,271			104,513	851	148,134	**810,968**
MO	55,559	255,049	217,527	404,651		851,890	245,119	110,402	339,116	895,313	12,457		299,587	5,854	336,741	**4,029,264**
MQ	202,877	306,434	325,398	312,865	13,241	324,983	109,802	249,485	374,728	506,280			180,294	57,429	494,490	**3,458,306**
MR	1,129,967	545,555	558,419	375,857		599,665	249,650	181,508	178,666	1,893,014		91,562	411,039	356	486,031	**6,701,289**
MT	44,967	30,631	2,548	98,079		31,792	14,122	40,716	33,085	218,117			50,097		38,576	**602,730**
MU	473	108,821	125,967	175,191		131,467	33,323	51,010	98,551	244,158			316,615	1,350	240,839	**1,527,766**
MX	0	3,651	26,569	29,445		26,882	2,939	46,983	0	10,270	0		12,918	576	15,046	**175,279**
MZ	0	20,864	124,414	7,420		264,791	9,483	852	70,940	37,631	30,773		103,167	284	7,164	**677,785**
	1,824,840	**3,099,832**	**3,115,809**	**3,350,175**	**47,022**	**5,027,626**	**3,050,223**	**1,973,440**	**2,863,225**	**8,755,974**	**811,990**	**91,562**	**3,443,338**	**127,026**	**3,870,823**	**41,452,905**

Table 9.4 Contract and Agreement Expenditures by State – FY06 Data

BOC Code	Alaska	Arizona	CA	CO	ES	FA	Idaho	Montana	New Mexico	Nevada	Oregon	ST	TC	Utah	WO	WY	BOC Total
Adv - Commercial	382	160	0	0	0	0	0	0	0	0	323	0	0	0	0	5,100	**5,965**
Adv - Pub Printer	599	0	0	0	0	0	104	0	0	0	0	0	0	0	0	0	**703**
Cont - Indian Self Det Ser	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**70**
Airplanes & Helos	409,696	-8,000	915	0	0	0	60,626	32,161	0	44,507	8,076	0	0	9,869	-1,190	13,006	**569,665**
Aerial Photography	0	0	39,302	0	0	0	0	12,150	0	0	0	0	0	0	7,000	0	**58,452**
Arch & Engr	0	0	75	0	0	0	72,191	-9	0	0	0	0	0	0	0	0	**72,257**
Consultant Non-Advisory	300	944	0	1,238	0	0	0	0	0	0	0	0	0	0	0	0	**2,482**
Consultant	0	0	1,145	2,038	0	0	5,181	0	0	98,740	16,000	0	0	0	0	0	**123,104**
Develop Data Sets	0	8,000	0	0	0	0	0	0	0	0	0	0	0	0	0	737	**8,737**
Drilling	3,567	12,629	0	0	0	0	16	0	0	0	0	0	0	0	0	0	**16,212**
Mapping	0	0	0	0	0	0	0	50,000	0	0	15,000	0	0	0	-552	0	**64,448**
Other	39,610	71,513	107,117	30,241	0	0	478,389	84,836	76,965	159,297	2,349,177	0	2,406	148,993	55,572	1,778,380	**5,382,496**
Photo Lab Operation	212	348	0	0	60	0	300	92	0	273	1,351	0	0	60	0	0	**2,695**
Professional Services	315	204,528	274,322	164,935	3,000	0	16,275	49,126	50,181	46,679	298,997	0	0	63,767	10,000	0	**1,182,125**
Studies	52,435	25,900	44,839	15,572	0	0	1,019	37,600	65,725	5,000	250,020	0	0	22,749	0	102,800	**623,660**
Training Services	0	0	0	510	0	0	0	0	0	900	0	0	14,405	0	0	0	**15,814**
Cooperative Agreements	557,957	343,806	433,192	196,838	14,829	185,600	672,176	1,109,512	610,007	775,251	624,374	0	0	646,491	199,393	192,058	**6,561,484**
Expenses Shop	0	0	153	0	0	0	0	0	0	0	0	0	0	0	0	0	**153**
Expenses Storage	0	0	77	0	0	0	0	0	0	33	0	0	0	0	0	0	**110**
Grants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Grants Subs & Contrib - Oth	0	0	0	0	0	0	-12,091	0	0	0	0	0	0	2,000	0	0	**-10,091**
Interest Expense	0	0	0	83	0	0	9	0	0	1	12	0	0	23	0	191	**318**
IT Supp Services	0	0	169	0	0	0	0	0	20,000	0	144,327	0	0	0	9,000	0	**173,496**
Joint Fund Agreements	-41,644	-18,061	0	0	0	0	0	-115,538	-292	0	-15,372	0	0	-19,725	0	-120,000	**-330,631**
Med & Hlth Care Svcs	125	0	426	87	0	0	527	806	0	137	2,882	0	0	0	0	0	**4,990**
Ops-Maint & RPRS - Bldg	229	70	3,529	215	0	0	650	103	0	1,392	0	0	0	0	0	0	**6,189**
Ops-Maint & RPRS - Oth	59	1,588	2,650	45	0	0	1,713	5,995	0	0	1,551	0	0	247	0	800	**14,648**
Private Sector R&D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Real Prop App/Title/Fees	0	0	0	0	0	0	0	0	3,632	0	0	0	0	0	0	0	**3,632**
Reimb Agreements Int	58,045	0	0	74,300	0	0	0	0	0	5,000	12,200	0	0	14,100	5,000	330,000	**498,645**
Reimb Agree - Oth Agency	8,600	-6,266	0	240,447	0	125,000	5,000	141,499	98,500	0	480,105	0	0	15,512	21,313	0	**1,129,710**
Rep & Maint - Equip	1,418	1,789	1,580	951	0	0	1,266	117	451	1,600	1,833	0	0	1,024	0	916	**12,944**
Rep&Maint-Oth	888	4,921	1,853	1,769	0	0	2,528	600	302	441	812	0	0	5,011	0	11,223	**30,350**
Rep&Maint-IT Equip	0	0	3,004	194	0	0	1,124	644	0	382	109	0	0	151	0	0	**5,608**
Service Facility-Oth	0	0	80	0	0	0	0	0	0	0	0	0	0	1,000	0	0	**1,080**

Subs & Lodging	465	0	0	0	0	0	0	0	0	0	327	0	0	0	0	0	**792**
Training Conf Reg Fee	11,067	7,097	1,553	6,850	0	0	20,603	6,015	8,654	4,974	9,542	140	15,042	11,413	0	5,154	**108,106**
Tuition	343	414	640	266	0	0	254	3,233	2,957	1,604	5,880	0	0	3,602	250	1,816	**21,257**
TOTALS	**1,104,736**	**651,381**	**916,620**	**736,578**	**17,889**	**310,600**	**1,327,858**	**1,418,942**	**937,082**	**1,146,211**	**4,207,525**	**140**	**31,854**	**926,288**	**305,786**	**2,322,181**	**16,361,672**

Table 9.5 Contract and Agreement Expenditures by State and PE – FY06 Data

STATE	BN	BP	BR	BS	BT	CB	MB	MI	MJ	MK	MN	MO	MQ	MR	MT	MU	MX	MZ	PE Total
AK	76,506	-5,393	0	211,519	0	135,046	0	0	0	10,992	0	104,485	78,709	446,694	36,333	-263	0	10,109	**1,104,736**
AZ	45,826	11,958	12,500	61	0	19,829	0	15,000	48,564	-333	2,953	49,493	1,855	122,785	165,600	84,957	0	70,333	**651,381**
CA	5,271	45,774	41,709	9,328	0	98,901	0	0	127	253	504	56,779	27,805	199,864	303,157	86,884	0	40,264	**916,620**
CO	5,334	50,092	8,153	12,083	0	165,191	-2,310	108,151	32,605	6,800	27,511	18,714	57,334	159,922	10,492	74,349	2,157	0	**736,578**
ES	0	0	0	-171	0	0	0	0	0	0	0	0	8,060	0	0	10,000	0	0	**17,889**
FA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	310,600	0	0	0	**310,600**
ID	1,216	10,599	20,739	30,240	0	250,606	595	0	43,062	1,881	3,500	186,491	125,185	337,116	13,356	20,738	262,500	20,034	**1,327,858**
MO	178,277	50,145	24,516	5,054	0	374,782	0	117,238	3,848	10,702	491	23,870	72,835	254,131	2,570	289,482	11,000	0	**1,418,942**
NM	80,947	144,965	20,540	21,573	0	75,805	0	50,000	101,138	102	0	99,971	142,029	196,871	97	3,044	0	0	**937,082**
NV	31,184	46,753	120,000	132,612	0	251,537	0	5,060	8,196	-2,545	43,470	86,296	133,698	167,462	29,000	2,090	0	91,399	**1,146,211**
OR	212,687	147,965	8,683	68,335	0	1,094,818	206,027	0	289,547	33,311	21,829	230,989	80,733	1,640,030	40,003	34,614	0	97,953	**4,207,525**
ST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	140	**140**
TC	9,349	0	0	0	0	0	0	0	0	0	0	0	0	22,505	0	0	0	0	**31,854**
UT	-4,276	102,299	3,071	5,983	0	245,952	76	17,470	45,691	2,442	5,680	17,051	236,483	200,518	292	41,841	0	5,712	**926,288**
WO	10,000	20,043	-552	32,500	0	35,000	26,893	26,508	0	0	0	10,000	40,250	105,145	0	0	0	0	**305,786**
WY	123,210	397	170,225	67,846	0	33,690	0	145,978	15,547	3,142	1,379	120,000	537,778	627,393	0	451,070	800	23,727	**2,322,181**
TOT	**775,532**	**625,598**	**429,585**	**596,963**	**0**	**2,781,157**	**231,281**	**485,404**	**588,326**	**66,745**	**107,316**	**1,004,139**	**1,542,755**	**4,480,436**	**911,500**	**1,098,807**	**276,457**	**359,671**	**16,361,672**

10 Recommendations and Discussion

To assist the BLM in meeting the I&M challenges outlined in this analysis, the following recommendations are submitted. These recommendations are designed to create, enhance, or inspire improvements in productivity and quality when conducting I&M activities throughout the BLM. Many BLM sites have developed or are developing highly creative "workarounds" to complete their I&M mission. The spirit of innovation shown by these forward-thinking local sites, when combined with the potential efficiencies made possible by the incorporation of these recommendations where applicable, may assist local and state organizations in meeting the I&M mission. The recommendations are not prioritized.

Recommendation 1: Consider adopting over the longer term a full cost recovery system for permits and monitoring of permitted activity. Part of the overall cost recovery scheme could very well have an option to have other parties do the monitoring required during the permitting process.

Discussion:

- BLM is driven by permits and other long-term monitoring requirements that prevent it from taking the bigger picture view of the overall health of the landscape/watershed. The annual monitoring programs in many FO's are, by the sheer force of expanding workload, permit-driven. In many FO's there is a sharp increase in energy-related permit applications (gas & oil, solar farms, wind farms) that has come about in only the past 12-18 months, as the price of oil has skyrocketed. This is likely only the bow-wave of energy permit applications on BLM lands. BLM managers and scientists know that a broader based monitoring program is the best way to achieve their long term objectives of determining overall land health. However, the redirection of personnel and fiscal resources to the more compelling requirements of monitoring to issue permits prevents such programs from occurring. More resources, which are not available in federal budgets, could be brought in through other means if permit fees reflected actual BLM cost.
- The key will be to identify the true costs of all BLM processes that can be attributed in whole or in part to permitting and to monitoring of permitted activity. A methodology such as Activity-Based Costing (ABC), with which BLM is familiar, would enable the Bureau to compare the costs of their current "As-Is" operation with a range of possible "To Be" operations. An ABC analysis would enable BLM to identify the specific costs of individual processes, which would establish a solid foundation needed to underlay a fee structure for permitting activities. Such an ABC approach could also enable BLM to determine the extent to which full cost recovery might ultimately lead to improvement of the overall health of the landscapes/watersheds being considered.

Recommendation 2: Update existing guidance for I&M activities to ensure the guidance is grounded in a cross-program understanding of the basic components for a successful I&M program. Use existing capabilities found on the BLM intranet as a central, web-

based repository for storing this information such that is easily available to all who require access.

Discussion:

- The National Monitoring Strategy found that monitoring methods are frequently redundant and guidance is often dated, sometimes contradictory, and not cross-walked between programs. This guidance is in the form of BLM manuals, handbooks, Information Bulletins (IB), Information Memorandums (IM), technical references, and email guidance received from program officials at the Washington and state levels. This situation was confirmed during telephone interviews and at field and district office site visits conducted in July, 2008. BLM specialists reported that they found it difficult to determine when guidance had been updated and also confusing as to what guidance was current. There was a stated desire that all manuals and handbooks be converted to electronic format and that all forms be accessible on-line.
- Additionally, specialists recognized the need for a readily accessible, web-based repository for current guidance that would assist in integrating the Bureau's monitoring activities. This would decrease valuable time spent conducting research to determine the appropriate guidance to follow. The BLM has existing capability on the NOC website that could serve as the one-stop repository of all information related to guidance for I&M.

Recommendation 3: BLM adopt USDA Forest Service inventory & monitoring guidance on forestry, with modifications as needed to meet BLM requirements.

Discussion:

- BLM Forestry guidance is outdated and is not used in some field office (FO) because it does not meet the needs of the Forestry program. Instead, some FO's are using monitoring guidance from the USDA Forest Service. Many BLM foresters feel that the Forest Service I&M guidance is up-to-date, relevant, and provides appropriate guidance to conduct the BLM Forestry program. Adopting the Forest Service I&M guidance and modifying it to meet BLM mission needs would be a cost effective way to rapidly update BLM Forestry Program guidance. Adopting one set of up-to-date guidance for all BLM foresters will promote consistent Bureau-wide practices. This approach has already been used successfully with regard to soils guidance being based on NRCS soils inventory & monitoring publications.

Recommendation 4: Develop and implement a plan that provides annual, standardized currency training to specialists in all disciplines. Additionally, stress mentorship of specialists to enhance their career development.

Discussion:

Standardized Training Program -

- Required annual training would lead to standardization of I&M practices in the field. More standardization of practices among the workforce will lead to

improvements in the ability of BLM to be successful when decisions are challenged in court. Lack of standardized data collection procedures and defensible methods of collecting data increases the likelihood of BLM losing when decisions are challenged. Standardized data collection procedures are essential to winning during litigation. Training will lead to better standardization, success in cases of litigation, and will ultimately lead to a reduction of or elimination of future litigation when potential litigants understand that it is a wasted effort to challenge BLM decisions.

- During telephone and on-site interviews specialists stated a strong desire for more leadership, guidance, and training regarding their programs. They spoke of the need for simplified procedures and robust currency training to receive updated program guidance and exposure to current science on I&M techniques. This could be achieved by developing a continuing education training plan that applies to all disciplines. This training program could be a mix of DOI Learn courses, classroom courses, and group training delivered in the classroom and hands-on in the field. Training would be an annual requirement but could be conducted throughout the year or in the off season as required. The National Training Center currently lists training opportunities in the areas of assessment, inventory, and monitoring. These courses could serve as the backbone of the training program, supplemented by the hands-on training provided on site. Additionally, the Local Work Group of the National Assessment, Inventory, and Monitoring Strategy has recommended the completion of a gap analysis to determine gaps in capabilities and requirements of current specialists, and then addressing the gaps with either current training opportunities or development of new training to address the deficiencies. The results of that gap analysis can be used to tailor the training program to address the needs of I&M specialists.
- The benefits of continuing education are that the specialists are exposed annually to current scientific practices applicable to their specialty as updates and changes occur. They would get exposure to current guidance related to all disciplines and specific to their own specialty. Group training sessions also provide opportunities for mentoring and for enhancing career development for specialists who are less experienced. A more educated and informed workforce is typically more motivated and supportive of overall organizational goals.

Formal Mentoring Program -

- We also recommend a renewed emphasis on the formal mentorship program at the local level to develop the careers of new hires and less experienced I&M employees. We discovered during telephone interviews and site visits that many new BLM employees are not afforded long-term mentoring opportunities. In some cases there simply isn't senior staff available to provide the required mentoring due to staff shortages or the amount of work required of the senior specialists preventing them from mentoring newer employees. The mentorship program was not stressed at the FO level. A search of BLM manuals and handbooks found no guidance dedicated to a formal mentorship program. The combination of an overloaded senior workforce and no specific guidance directing a mentoring program has caused formal mentorship to fall by the wayside.

- Mentoring provides intangible benefits that do not necessarily appear in cost/benefit analyses. Mentored employees are better trained specialists who will accomplish their tasks in a more efficient manner. They also have better morale which leads to more stability in the workforce and decreased personnel turnover and related costs in the future. New employees need mentorship from senior specialists who understand foundational requirements for I&M. A renewed dedication to formal mentorship by local management will create both tangible and intangible benefits for I&M specialists.

Recommendation 5: Standardize I&M data collection and storage across the BLM. Aggressively pursue the ongoing efforts of the National AIM Strategy and the MEDS subcommittee to achieve improved data management capabilities. Establish a policy and guidelines for dealing with legacy data.

Discussion:

Data Standards - The BLM does not comply with standard data collection, storage, or reporting procedures currently in place. This was a finding of the Local Work Group of the National AIM Strategy and was confirmed during our telephone interviews and site visits.

- BLM Manual 1283 Data Administration and Management, dated 11/25/02 outlines policies and guidelines to direct BLM efforts in the effective management of data collected and used to support the BLM mission. As stated in this manual *"The BLM, as an information resource, needs to ensure that the data it collects, uses, and disseminates relates to its mission requirements, is applied and used objectively, and has appropriate controls to protect privacy, proprietary, and confidential information. Data Administration includes the concepts of data quality, data privacy, data security, and database integrity. To accomplish this, BLM will standardize data definitions to reduce ambiguity and data disparity, facilitate reusability and sharing of data across BLM Programs, cooperate with other Federal and State Agencies to promote use of equivalent interagency data standards and data sharing, and provide appropriate Data Administration/Data Resources Management and Data Stewardship training for employees to maintain their technical competency."*[11]
- Successfully managing data throughout its life cycle is fundamental to a successful I&M program. There currently is an adequate programmatic structure in place to manage data collection and data administration activities in the I&M programs, but the procedures are not followed or are not widely known throughout the BLM.
- There are other BLM guidance documents concerning data collection, information systems, and records management that are currently in use as well. These include BLM Manual 1268 Information Technology Configuration Management, dated 4/3/03, BLM Manual 1263 Equipment, Software, and Services, dated 9/8/82, and BLM Manual 1220 Records and Information Management dated 12/21/94 with updates. Much of this guidance appears to be redundant and much of it is dated.

[11] BLM Manual 1283 Data Administration and Management Release 1-1678 (11/25/02) 1

- To successfully implement this recommendation, a review of BLM guidance, as it applies to I&M activities is required. The review must include guidance related to data collection, storage, information management, information systems, and records management to determine what is current and pertinent so it can be applied to the collection and storage of I&M data.
- As a key part of the I&M data collection and data management improvements, the BLM may want to establish a data roll-up strategy as well as provide access to linked databases designed to enable appropriate access to analyzed data at all levels. The inability to share or compare resource data or analyses makes it difficult to prioritize investments or demonstrate results at the field office, regional, or at the National level. With appropriate policy and procedure in place which are known and abided by at all levels of BLM, analyzed data can be rolled-up to answer management questions and make appropriate decisions up to and including the WO level.
- Data standardization must recognize limits to which data can and should be standardized. Not all data needs to be available at all levels and therefore not all data elements require standardization. Local offices should retain flexibility to collect data based on local needs.

Data Collection Devices - Once standard data schemes have been established, the BLM needs to select, and encourage the use of, standard and compatible devices (like a Trimble or Toughbook) for collecting field data. The selected devices will allow easy interface with the data storage systems.

- Many field offices are already using varying types of hand held devices (data recorders) with a wide variety of capabilities for collecting field data and uploading it to a data base. In most cases these devices are used only for local applications.
- A standard device with generic capabilities (GPS link, configurable templates, pre-defined formats, data dictionaries, etc.) can be used to collect and upload data into the standard BLM data systems. If BLM establishes a basic ordering contract that any BLM office or Program could write a purchase order against, it will be easy for local offices to obtain the pre-selected devices when they are ready to make a purchase. This will lead to similar devices being used throughout the bureau.
- Hand held data recorders can save time in both the collection and recording of the data and can improve the quality, completeness, and accuracy of the data through software editing and filtering schemes.
- Intangible benefits include reduced fatigue for data collectors which also lead to improvements in data collection efficiency and accuracy. Additionally, some hand held systems allow for instant analysis of collected data while still in the field, allowing stakeholders who may accompany BLM staff to the field to see the results of data collected on a real time basis. This also allows the data collector to adjust, if necessary, their monitoring and data collections based on the feedback being received.

Legacy Data - Establish a policy and create national level guidelines and a corporate strategy for handling legacy I&M data.

- BLM has been collecting and storing data for many years. Often data is stored in paper files or stored on outdated software that is no longer useable. These factors combine to increase the chances that this legacy data will be lost, compromised, or never used in any meaningful way to understand resource condition and trends or to answer management questions regarding the status of the health of the land. Data storage using these methods inhibits sharing the data beyond the local office, preventing it from meeting additional BLM program needs or the needs of other federal, state, local, or public entities that could potentially benefit from access to this data.
- A standard policy and detailed national level guidelines and corporate strategy for managing legacy data to ensure it is viable for future uses would benefit the BLM. The policy and guidelines needs to address what types of data are to be retained, digitized, and stored, and the reusable electronic formats and software to be used.. These also need to identify and assess legacy data that no longer has meaningful value and is not worth the time and expense to preserve. This important step will make this initiative more manageable in terms of time, effort, and cost.

Recommendation 6:

- Employ digital imagery and 'SamplePoint' software (developed and owned by the federal government) as tools to increase the quantity, reliability, and usability of rangeland and reclamation monitoring data, while dramatically reducing costs.
- Develop a system for the storage and management of the large volume of data generated by aerial and land-based digital imagery monitoring methods.

Discussion:

Digital Imagery & SamplePoint – Use of these technologies would allow BLM to increase the amount of rangeland I&M accomplished without exceeding current budget and resource constraints.

- Digital imagery can be captured in a number of ways (see examples below of current BLM R&D projects)
- SamplePoint' is a tool that enables the use of high-resolution, image-based methods that can increase the speed and accuracy of ecological monitoring. It can be used with both aerial and ground sampling protocols. Image-based methods provide a permanent record of field plots. This permanent record offers managers the opportunity to conduct analysis by different criteria or intensity at any point in the future. The approach provides enhanced opportunity for using data supplied by cooperators because data taken from images can be verified from independent analysis at any point in the future.

Examples of the Use of Digital Imagery and SamplePoint software in BLM

Example 1. Employment of UAV's (Unmanned Aerial Vehicles) for aerial imagery.

- One district in Idaho has funded research for an unmanned aerial vehicle (UAV) to be used as a district I&M asset in the collection of very large scale aerial (VLSA) photography.
- The UAV can be used to conduct vegetative monitoring of potential and existing fuels projects, areas undergoing fire rehab, permanent trend plots, noxious weed infestations, sensitive plant monitoring, habitat monitoring for sagebrush obligates, BLM allotments scheduled for Standards & Guidelines (S&Gs) assessments, and allotments that have undergone management changes.
- This technique involves capturing imagery from 50 to 1000 meters above the ground using cameras imbedded in a UAV that record 1mm resolution. This imagery is then interpreted by the SamplePoint software system which provides accuracy comparable with the most accurate field-methods for ground-cover measurements.
- Further successful tests of this system will allow the District to increase the amount of land surveyed using fewer resource specialists at a decrease in cost per acre for the I&M effort. Initial cost information indicates that the cost of monitoring using a UAV would be one fourth the cost of traditional rangeland monitoring.

Example 2. Employment of a piloted ultralight aircraft for aerial imagery.

- BLM Wyoming (Cheyenne) has funded and collaborated with the Agricultural Research Service (ARS) to develop the piloted aircraft method of capturing digital images. The manned aircraft aerial method allows for increased sampling intensity at low cost relative to the time and travel required by ground methods. Air time for the aircraft in use is $150/hr. The camera costs approximately $3000. The pilot and aircraft are contractor-provided.
- The ARS and BLM researchers have concluded that their aerial surveys are a cost-effective monitoring method, that ground with aerial data-set correlations can be equal to, or greater than those among ground-based data sets.
- The piloted aircraft can also be used in the same manner as the UAV's. They can be used to conduct vegetative monitoring of potential and existing fuels projects, areas undergoing fire rehab, permanent trend plots, noxious weed infestations, sensitive plant monitoring, habitat monitoring for sagebrush obligates, BLM allotments scheduled for Standards & Guidelines (S&Gs) assessments, and allotments that have undergone management changes.
- Successful employment of this system will enable state rangeland leads to dramatically increase the amount of rangeland surveyed with fewer resource specialists and dollars expended.

Example 3. Use of land-based digital imagery methods for rangeland monitoring.

- Field offices in Casper and Worland, Wyoming have developed and fielded a land-based digital imagery method that uses a hand held digital camera to photograph monitoring plots. The digital images are then interpreted by the 'SamplePoint' software. Use of this land-based digital imagery method has the same utility as the aerial photography approach. Range managers using this concept get reliable data that is repeatable, collected quickly, and defensible.

Since field data collection involves photographing plots, large numbers of transects can be run in short growing seasons, and evaluated in subsequent seasons when workloads are less acute.

- Through the use of 'SamplePoint,' BLM specialists and managers can conduct I&M efficiently and save resources.

Data Storage - Use of aerial and land-based methods of collecting digital imagery will generate large quantities of data. To accommodate this, mass storage hardware devices will be required along with software to facilitate the storage and retrieval of the data. Data retrieval and analysis processes may need to be reengineered to allow BLM specialist to maximize the utility of the data. Whatever data formats are used, they must also be compatible with the BLM standards established in Recommendation 5 above.

Recommendation 7: Place a high priority on remedying the shortage of soils expertise at field locations by:

- Providing formal training in soils to at least one scientist in each district or field office.
- Highlighting and targeting the shortage of soils scientists in the BLM recruitment strategy.

Discussion:
Field offices report that training in soils is inadequate, while at the same time soil surveys from NRCS have declined in quality, containing many errors. NRCS experts have become more difficult to access as NRCS centralizes. Meanwhile, some states have only one BLM employee who is a trained soils specialist. Soils scientists are currently the most compelling shortage of specialists that the Bureau is experiencing.

Recommendation 8: Establish a policy that requires field offices to develop a planning process that facilitates their ability to manage resources on a landscape/watershed basis and leads to an informed decision on what I&M work needs to be accomplished and how it can be integrated with other activities required within the landscape/watershed. In concert with this, increase the effectiveness of interdisciplinary (ID) teams consistent with current guidance and regulations.

Discussion:
Planning Process - At the field office level, delineate large geographic areas (based on landscape, watershed, and/or allotment boundaries) and all activity (including I&M) that needs to take place within the area over a specified timeframe. Where possible, this should be done for the entire field office area during the planning process and the watershed boundaries and watershed assessment schedule included in the land use planning process.

- Identify all I&M activity that will be required to complete and support a qualitative analysis prior to the year the watershed/landscape/allotment is scheduled to be assessed. Consider the resources within the watershed to assign an appropriate interdisciplinary team to assess "land health" in the watershed (e.g. acres of forest, sagebrush, wetlands, aspen, mahogany, and other habitat, miles of

riparian habitat, wildlife and fisheries populations present, impaired water quality, etc.). Package the watershed or landscape into one, program integrated, ecological "land health" assessment followed by one NEPA document.

- The Dillon Field Office provides an example of how this planning process works using a three year I&M planning cycle as follows:
  - It begins with the first year concentrating on gathering existing monitoring data to be used to support qualitative assessments and help understand vegetative trends. This monitoring is generally completed by seasonal employees.
  - The second year the watershed is assessed by the ID team and a "Watershed Assessment Report" is prepared and released to the public.
  - The third year, a watershed level, program-integrated Environmental Assessment is prepared and released to the public for a 30 day comment period followed by a Proposed Decision and if necessary, a Final Decision. Implementation of the decision begins following the appeal period.
  - During any given year, the field office is involved in pre-assessment monitoring, assessing, preparing NEPA and decision documents and various stages of implementation in the delineated watershed areas within the area administered by the field office (as many as 17 in the example we saw). The Dillon Field Office has also included the watershed boundaries and watershed assessment schedule in the RMP ROD.
- While this multiyear planning process may seem difficult and time consuming, it facilitates better analysis of cumulative impacts resulting in more informed decision making. It also saves time in the end because it combines EA requirements for all programs (Term permit renewals for multiple allotments, range improvement projects, timber harvest, fuels treatment projects, travel management, wildlife and fisheries projects, etc.) into one EA (as opposed to 30 to 40 smaller EAs). This approach has also increased internal understanding and support of decisions and reduced opportunities for litigation.

Interdisciplinary (ID) Teams - Increase the effectiveness of ID Team deployment for I&M work consistent with current BLM guidance and regulations for ID teams. Procedures and characteristics of the effective use of ID Teams include:

- In December each year, the field office manager (or assistant) appoints, in writing, ID Team members for the next summer's I&M work. The letter states the work to be done, deadlines for accomplishing the work, each member's role on the team, and the priority to be given to ID Team work.
- ID Teams consist of a core team and a support team that provides specific scientific expertise.
- Each team has an assigned leader to finalize recommendations but teams operate on a consensus basis when evaluating their findings. Minority opinions are documented in the team reports.
- Develop criteria for the ID Team to follow when making assessments about land health. Guidance will provide specific threshold criteria related to passing and failing standards.

- Team dynamics and effectiveness is fostered by members learning from each other and taking advantage of each others knowledge and experience.
- Extensive use of ID Teams to carry out field office priority work helps to reduce monitoring not grounded in high priority needs.

Recommendation 9: Pursue all means to increase efficiency when conducting I&M activities to include increased use of partnerships, cooperative and interagency agreements, memoranda of understanding (MOU), and focusing on development of more efficient contracting procedures to enhance the use of contracting opportunities. Have contracting vehicles, such as indefinite delivery indefinite quantity (IDIQ) and basic ordering agreements (BOA), in place for field offices to access immediately.

Discussion:
Cooperative agreements, challenge cost share arrangements, and other partnering opportunities leverage the BLM's appropriated funds by making contributions toward either funding or actually conducting I&M activities. With level or declining budgets and no foreseeable increase in available personnel, it is increasingly necessary to stress the opportunities these arrangements provide to achieve strategic goals and local office I&M requirements. Integral to enhancing these opportunities is creating streamlined methods for field offices to contract for I&M services. Contracting I&M activities can be a cost efficient means to providing meaningful contributions toward completion of I&M requirements. Local offices may avoid taking advantage of contracting possibilities due to the complexities they face with current contracting procedures. Streamlining the contracting process wherever possible through the use of multiple award contracts or Indefinite Delivery Indefinite Quantity contract vehicles available for I&M will make it easier for local offices to take advantage of these contracting opportunities.

Recommendation 10: Within the National AIM Strategy framework develop a virtual, dedicated and institutionalized "SWAT" Team that focuses on promotion of best ideas and rapid removal of barriers that prevent efficient I&M efforts.

Discussion:
In coordination with the efforts of the national AIM strategy, the SWAT Team would be permanently assigned and membership would be drawn from current resource specialists from the field and from I&M subject matter experts from throughout the BLM. The SWAT Team would exist in a virtual organization, and be called to action as needed. The SWAT Team would have cross-functional expertise to have the knowledge and experience to appropriately handle any best idea or resolve any barrier they may be called upon to address. If appropriate expertise is not available then the team could tap needed resources and expertise throughout the BLM on an as needed basis to attend to the issue at hand. Roles and responsibilities of the SWAT Team include:

- A centralized technology clearing house in the form of a SWAT Team would provide exposure to any best idea or new I&M concept submitted for review to a wider audience that stands to benefit from their implementation. The SWAT Team would be regularly advertised through e-mail, internal web sites, and other

BLM correspondence so employees would be more apt to share what best ideas are working for them with the wider BLM audience. If appropriate, these best ideas or emerging technologies would then be publicized throughout BLM and made known to those who would stand to benefit from their use.

- Serve as a central source for development and sharing of lessons learned. Lessons learned could be a valuable source of information for local offices that do not normally share information but conduct similar programs.
- Encouragement of employees to forward their innovations/best ideas to the SWAT Team. A reward/recognition program could be established (a suggestion program may already exist) to compensate employees in some manner for providing new ideas or emerging technologies that have potential for Bureau-wide consideration.
- Championing the most promising ideas to find additional funding and expertise to further their development. This would create benefits by maturing the idea or technology to the point that BLM could take advantage of their applicability through their wide spread use.
- Addressing organizational barriers that may prevent efficient I&M activities. A barrier is defined as an organizational issue that prevents I&M from being conducted efficiently or causes I&M to be done inefficiently. For example, lack of adequate personnel manning in Range Management for a State organization is a barrier. Or the fact that in some areas public land is checkerboarded with private land and that causes inefficiencies related to conducting full scale land health assessments on small plots of land. The focus of the SWAT Team would be on addressing process improvements to eliminate these barriers rather than on instituting band-aid fixes to individual situations. Use of a consistent methodology to develop solutions to remove barriers leads to an institutionalized process designed to rapidly and efficiently remove barriers to more efficient I&M operations.
- Investigating barriers validated by the BLM Field Committee. Barriers can be initiated from WO, State level, or could come from any source within BLM but would be validated by Field Committee prior to assignment to the SWAT Team. The SWAT Team would report to the Field Committee based on established deadlines for progress and barrier removal activities.
- Overall benefits to forming a SWAT Team are:
    - Provide increased visibility to best ideas previously known only at the local level. Incorporation of these best ideas on a wider scale will lead to increased efficiency in I&M activities.
    - Promptly address and resolve issues that are adversely affecting I&M
    - Cross-functional team with the right expertise dedicated to promoting best ideas and resolving barriers.
    - Results are driven by established timelines
    - Results are validated by senior management
    - Results are widely shared throughout BLM.

Recommendation 11: Explore the concept of creating monitoring centers for multiple program areas, e.g. Rangeland management, Forests/Woodlands, Air/Climatic conditions, and Invasive Species. Institutionalize the existing National Aquatic Monitoring Center.

Discussion:

Program Area Monitoring Centers - Replicate the business model BLM has already refined for a university-located monitoring center. This approach could mimic the national level model of aquatic monitoring or it could be adapted to regional or state levels.

- The National Aquatic Monitoring Center at Utah State University is the monitoring center BLM has already developed and has perfected as a working business model. It can serve as the prototype for any level. The National Aquatic Monitoring Center has demonstrated this business model can provide extraordinary Returns On Investment (ROI) for BLM. In the Utah prototype, the director is the only BLM employee, while BLM gains the benefit of the work of more than 20 other employees who work for the director. BLM provides roughly ¼ of the funds for the lab at approximately $400K per year. Other agencies providing the bulk of the funds are the United States Forest Service (USFS), the State of Utah, and non-BLM customers. This monitoring center approach enables significant leveraging of BLM funds for monitoring, analysis, and training, as well as a mechanism to bring in other government and private funds that benefit BLM's monitoring work. Equally important is that satellite offices at universities can be staffed with subject matter experts that can provide scientific expertise that is currently lacking in most BLM Field Offices. This expertise can then be tapped by all field offices. This provides a substantial ROI as field offices are and can be staffed with lower paid generalists who can then rely on a few strategically placed satellite office scientists who can provide them with more advanced scientific expertise as required. Personnel at these satellite offices also provide a valuable recruiting and training resource for BLM field offices for both seasonal and permanent employees. Remotely-stationed personnel also seem to be more able to accomplish longer-term specific assigned duties whereas field office personnel must be responsive to whatever issue needs attention at any particular time, but takes away from longer-term projects. With this issue in mind, this model has been recently implemented by the National Park Service for their Monitoring Network. Employees assigned to the Monitoring Network are stationed in separate offices, most often at Universities, where they are shielded from day-to-day crises that would typically affect them if they were stationed at a more traditional National Park Office. This autonomy allows these employees to focus on their mission of developing and implementing natural resources monitoring programs. The USFS, as part of the President's Healthy Forest Initiative, uses this model as well for the Pacific Northwest's AREMP and PIBO monitoring programs. The USFS's Forest Inventory and Analysis program uses the same model as well.

Institutionalize the National Aquatic Monitoring Center - Institutionalize the National Aquatic Monitoring Center to ensure its continuity and to facilitate replication of the business model.

- Assign a second federal employee (preferably a BLM employee) as a deputy. A second BLM employee would greatly enhance the capability of the National Aquatic Monitoring Center to provide assistance to BLM field offices, as current assistance needs are limited by the amount of work a single person can accomplish. A second employee would also ensure that if one person left, there would be a seamless transition while a vacancy was filled.

11 Conclusion

Inventory and Monitoring are key functional core competencies for BLM. A significant amount of I&M data is collected annually and BLM expends a large portion of its appropriated funds conducting I&M activities. Both large scale and local level improvements to I&M activities will enhance the ability to conduct I&M more efficiently while still meeting mandates and local requirements, and will ensure the future success and viability of BLM and the I&M program.

There are a number of recommendations provided for improvement in this report. These recommendations reflect issues which affect I&M activities daily, and apply across every BLM state. Data collection efforts are driven by permits and projects at the local level and it is difficult to report on occurrence, condition, or trend at any scale other than the site. Most data is collected on paper and is not stored on a common data base. Although improvements in these areas are being achieved throughout BLM, it remains difficult to share data among resources, share data with external stakeholders, analyze resources to establish condition and trend, or use data in planning documents. Geo-referenced data is the exception not the rule. Quality external data sources exist and are available to BLM personnel, but a coordinated policy is lacking for consistent selection and use.

These issues are all surmountable given appropriate priority, attention, and focused application of resources. We found a superbly dedicated workforce that is involved with conducting I&M. These employees make every effort to do what is right to maintain the health of the land and ensure the success of BLM through innovation and resourcefulness, most often at the local level. With a quality workforce to assist in addressing these issues, inevitable improvements will be made that will enhance the ability of BLM personnel to conduct more efficient and effective I&M, provide stewardship for public lands and resources, efficiently expend taxpayer dollars, and meet BLM strategic mission objectives.